

THE MALE OF THE SOUTH AMERICAN KATYDID GENUS *PHLUGIOLA*,
AND A NEW RELATED GENUS FROM THE SOLOMON ISLANDS
(ORTHOPTERA: TETTIGONIIDAE, MECONEMATINAE)

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ABSTRACT—*Phlugiola* is a rarely collected genus of small katydids, apparently restricted to South America in nature, initially placed in the Listroscelinae but more recently transferred to the Meconematinae. A male from Peru of *P. redtenbacheri* Karny, here described, is the first of that sex to be reported. A second species, *P. dahllemica* Eichler, known only from females which once were established in Berlin, Germany greenhouses, has not been found since World War II. In 1969 Chopard described *P. gressitti* from the Solomon Islands; however, examination of the type reveals substantial differences which are the basis for the present description of *Lucienola*, new genus. A key to these 2 genera and the related *Phlugiolopsis* is included. Finally, a female from the Philippine Islands, evidently of a genus related to but distinct from *Phlugiola*, is discussed briefly.

In 1950 my old friend, the late Harry A. Allard, a retired botanist, collected some insects at Tingo Maria, Peru; 1 of these insects is the first male of *Phlugiola redtenbacheri* Karny to be reported. Because of its distinctive features and the rarity of the species, a description is appropriate, especially so for comparison with the unique male holotype of *Phlugiola gressitti* Chopard from the Solomon Islands. Chopard (1969), lacking a male of true *Phlugiola*, was misled into believing the 2 species are congeneric, though in fact there are several separating characters which I regard as generic in addition to those peculiar to the males. No described genus appropriate to receive *gressitti* is known to me, so I am describing *Lucienola*, new genus, in honor of Dr. Lucien Chopard (1885–1971) in recognition of his approximately 65 years of active, distinguished publishing on Orthoptera. At the same time, various generic characters of considerable interest in these and related genera are discussed.

Historical Review and Materials Examined

Phlugiola was established by Karny (1907:103) who described *P. redtenbacheri* from a single female, now preserved at the Naturhistorisches Museum, Vienna, which was part of an acquisition from Surinam, obtained in 1899 from the Staudinger firm. There is no published record of additional South American material, and Chopard (1969:48) stated that the species has never been recovered in its native country. Ley (1951) also noted the uniqueness of the original

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type. However, I have examined a single female of *redtenbacheri* from Teffe, Amazonas, Brasil, XII-10-1919 (H. S. Parish) (Acad. Nat. Sci., Phila.) (Det. Hebard, 1926). On the date label of the Teffe specimen, the third digit for the year is unclear, but accounts of Parish's Brazilian travels show that the year was 1919 (Alexander, 1921, 39-41; 1959). This area is about 800 miles from Surinam. The Teffe specimen agrees well with the type as described by Karny (1907; 1913) and Eichler (1938). The Peruvian male (Tingo Maria, Peru, collected 19-II-1950, in jungle, H. A. Allard) (USNM), from an area some 800 miles southwest of Teffe at an altitude of about 2,000 feet, also agrees well except for sexual features.

A second species, *Phlugiola dahlemica*, was described by Eichler (1938) from greenhouses in the Botanic Gardens at Berlin-Dahlem, Germany. It existed on various tropical plants there for 15 years or more (Harz, 1957:183) and, though its native home was uncertain, a South American origin has been conjectured (Chopard 1969:51). More than a dozen notes and papers on this species appear in the German literature. Ley (1951:292-294) stated that an air attack in 1944 partially destroyed the greenhouse holding *dahlemica* and that the little katydid apparently perished from the cold. The only confirmation available to me of this popular account is the report by Harz (1969:178) that since 1945 *dahlemica* has not been taken in the Berlin greenhouses.

Two apparent misunderstandings about *Phlugiola* occur in Chopard's 1969 paper. He referred to a third species of *Phlugiola*, said to be from the Botanical Gardens in Kew, England. This species probably is the 1 described from Kew by Zeuner (1940) as *Phlugiolopsis henryi*, which has never been assigned to the genus *Phlugiola*. Chopard also credited the entomologist F. Zacher with reporting *Phlugiola* from the gardens at Kew in 1928; actually, Zacher (1928) reported *Phlugiola* from Berlin-Dahlem under the name *redtenbacheri* prior to Eichler's detailed study of *dahlemica*, and this may be the publication Chopard mentioned.

Although the food habits of *Phlugiola redtenbacheri* are not recorded, the insect probably is predaceous, to judge from the habits of *P. dahlemica* and *Phlugiolopsis henryi*. The former was found by Eichler (1938) to feed primarily on vinegar flies (*Drosophila* sp.), whereas *Phlugiolopsis* was described by Zeuner as feeding mainly on slow-moving insects such as aphids and mealy-bugs.

The acoustic spiracles and their importance in generic definition: One difference between *Phlugiola redtenbacheri* and *P. gressitti* is the presence in the former of an acoustic spiracle (fig. 3, *as*), located in the proepimeron, just ventroposteriorly of the regular spiracle or "truncal spiracle," so-called because it is the normal first thoracic

spiracle connecting with a main tracheal trunk. No acoustic spiracle is evident in *gressitti*, and the opening may be concealed by the flap of the proepimeron. The occurrence, size, and location of acoustic spiracles in Ensifera, especially Tettigoniidae, are sufficiently significant to warrant a few explanatory remarks about these often overlooked structures. The acoustic spiracle, frequently much larger than the truncal spiracle, is not part of the main respiratory system, but instead provides the entrance of air to the front leg by means of a trachea leading to the tympanal organ so frequently present at the base of the front tibia in Ensifera. Presumably, the occurrence of air both outside and within the auditory area of the tibia contributes to efficiency in hearing. Extensive basic studies of the acoustic spiracle were made by Graber (1876), Zeuner (1936), Ander (1939) and Lewis (1974). However, in spite of the sometimes large size and conspicuous appearance of these organs, in Decticinae for instance, to which Rentz (1972) has applied the term "auditory structure" while calling attention to generic differences within that subfamily, general works and textbooks have paid slight attention to these interesting and distinctive organs. Sharp (1895:316-317), an exception, had a brief account. Some of the related structures, such as the *subgenual organs* and *crista acoustica*, both often mentioned in specialized accounts, have been discussed and well diagramed by Chapman (1969: 603-610). I am following Hartley (1973) in using the term *acoustic spiracle* for what has been variously called the "femoral stigma," "auditory stigma" and, together with the truncal spiracle, the "double stigmata."

KEY TO PHLUGIOLA AND CLOSELY RELATED GENERA

1. Front femur unarmed beneath; tergum 10 of male not divided by longitudinal posterior cleft; vertex of head with distinct but short cone extending in front of sides of vertex; posterior margin of male subgenital plate with stout spine, directed posteriorly, each side of midline (fig. 12, D of Zeuner, 1940); cerci of female short and stout. (Natural distribution unknown; adventive in England) *Phlugiolopsis* Zeuner
- Front femur armed ventrally with several small spines; tergum 10 of male conspicuously divided by longitudinal cleft; vertex of head without distinct cone (fig. 1); posterior margin of male subgenital plate specialized otherwise than above; cerci of female long and slender in *Phlugiola*, unknown in *Lucienola* 2
2. Front tibia with 5 pairs of movable spines on ventral surface; male pronotum expanded considerably in posterior half, sheltering tegmina (fig. 1); head in lateral view only moderately oblique; prothorax with conspicuous acoustic spiracle (fig. 3, *as*) in addition to truncal spiracle; male cercus with large basal arm; male subgenital plate with styli developed as long arcuate appendages (figs. 1, 2). (South America, adventive in Germany) *Phlugiola* Karny

- Front tibia with 4 movable unpaired spines on ventroanterior margin; male pronotum not expanded in posterior half, not covering any of tegmina (fig. 4); head in lateral view extremely oblique; prothorax without noticeable acoustic spiracle, only truncal spiracle; male cercus without basal arm; male subgenital plate with small styli borne laterally, the posterior margin specialized with sharp laterally directed "tooth" on each side, no terminal appendages. (Solomon Islands) *Lucienola*, new genus

Phlugiola redtenbacheri Karny, male

Head with fastigium not reaching to extremities of antennal scrobes; eyes bulging, reaching posteriorly much nearer pronotum than in *Lucienola*; no ocelli evident; face moderately oblique; exposed area of occiput short; prosternum unarmed; pronotum much swollen, expanded above tegmina, without distinct sulci or carinae.

Front femur with 3 spines mid-way on ventral surface (a more distal pair, and a single 1 on ventro-anterior margin); front tibia greatly expanded in basal 3rd, with large oval open tympanum of about equal size on each side, ventral surface with 5 pairs of movable spines, those toward apex of decreasing size and the anterior 1 of each pair somewhat longer, the most distal pair with posterior member rudimentary (right leg) or absent (left leg); apex of front and middle tibia each with pair of tiny terminal ventral spurs; middle and hind femora unarmed; middle tibia with 2 unpaired, well-spaced medium-length movable spines in mid-part of ventral margin; hind tibia with about 25 short spines along each dorsal margin, apex with 2 pairs short, sturdy spurs; all tibiae with some short but strong bristlelike setae, these regular and conspicuous along margins of hind tibia.

Abdomen small, especially reduced in size near base (probably partly due to shriveling), setal covering very sparse. Tergum 10 deeply, broadly divided, a short heavy tooth directed mesoposteriorly on each side of posterior margin; ultimate sternum (subgenital plate) broad at base, the mid-ventral surface somewhat pinched and with narrow keel along midline, apical part narrowed and divided into arms bearing the forcepslike styli; latter apically clavate, with thin partial flanges along inner margins bearing numerous setae; each cercus bearing strong, long sensory setae, with conspicuous meso-dorsally directed basal arm, the posterior apex gently incurved, somewhat toothlike in shape.

Color: Body mainly pale straw color; dorsum of head, some anterolateral portions of pronotum, and most of maxillary palpi tinged with pale green; prozona of pronotum near midline dirty pale orange, metazona and posterior margin with dark design as figured; eyes mottled with brown and pinkish; antennae pale, with dark annulae; tarsi dark brown; dorsal spot near base of abdomen and area of 10th tergal emargination blackish; apical part of styli brownish.

Specimen collected in Tingo Maria, Peru, on Feb. 19, 1950.

In the following table, measurements (in millimeters) of the male of *redtenbacheri* are shown compared with those of the Teffe, Brasil female, those given by Karny (1907) for the type-female of *redtenbacheri*, also those for a female from Leyte, Philippine Islands, of an uncertain genus resembling *Phlugiola* which is discussed later in this paper.

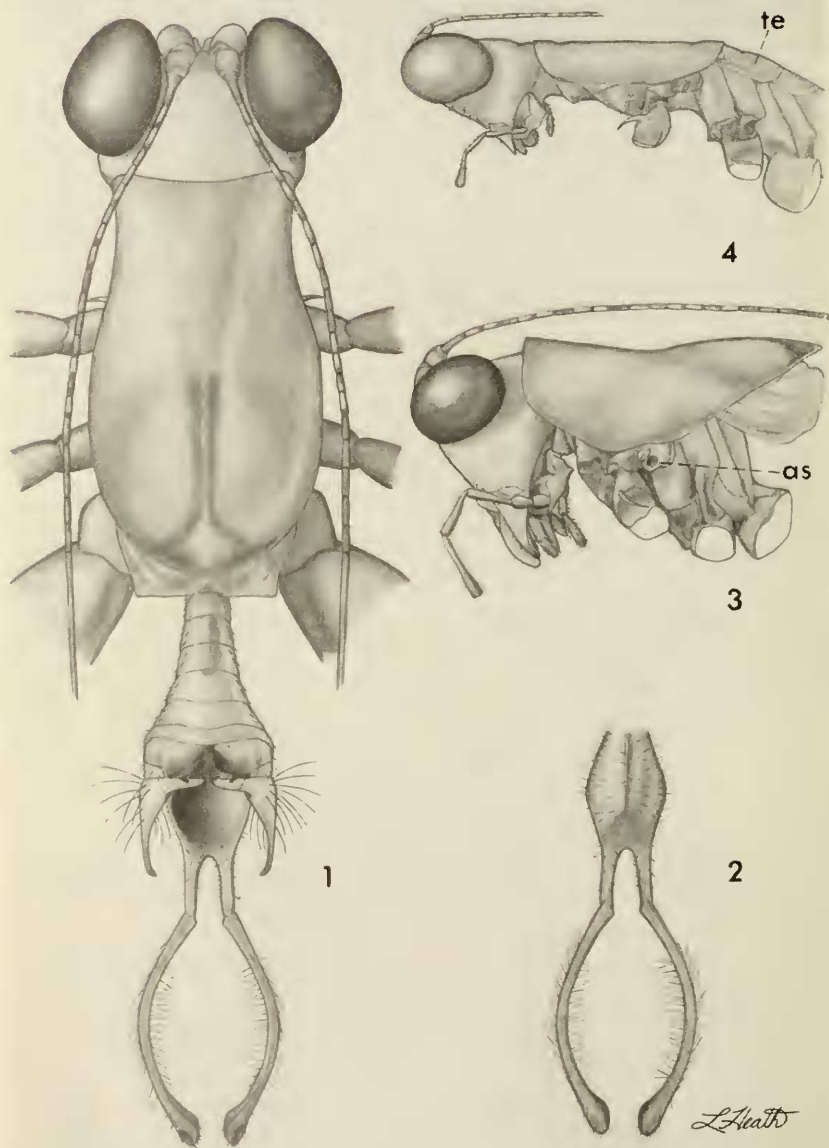


Fig. 1-3. *Phlugiola redtenbacheri* Karny, male. 1, dorsal view. 2, ventral view of subgenital plate. 3, lateral view of head and thorax (only coxae of legs shown). as—acoustic spiracle.

	♂ from Peru	Type ♀, after Karny	♀ from Teffe, Brasil	♀ from Leyte, P. I.
Body length, including ovipositor, in case of ♀ ♀	6.7	9.5	14.0	19.0
Pronotum	3.9	3.0	3.3	3.6
Tegmen	1.5	2.0	2.0	2.0
Hind femur	10.3	10.3	11.1	12.5
Hind tibia	10.5		11.3	13.0
Ovipositor		3.0	4.6	6.5

Lucienola Gurney, new genus

General build small, slender, brachypterous, flightless; body smooth, weakly shiny, with scant short pubescence. Eyes extending anteriorly to fastigium and dorsad of interocular area, very globose, bulging; ocelli not evident; fastigium not attaining apices of antennal scrobes; face very oblique; maxillary palpi 5-segmented; labial palpi 3-segmented; antennae long, delicate; head tapering posterior to eyes, with narrowed occipital portion shaped for reception in pronotum.

Pronotum oblong rectangular, mainly parallel sided, lateral lobes with very small bulge above front coxae, short transverse sulcus in front of bulge, median area not cut; sterna without spines; front coxa with conspicuous spine; 1st truncal spiracle on proepimeron, acoustic spiracle not clearly evident, apparently partly covered by proepimeron; tegmina not covered by pronotum, very reduced, closely appressed to body (0.7 mm long in *gressitti*); hind wings not evident. Front femur with 2 simple, unpaired, inconspicuous, well-separated spines in middle 3rd of ventral margin; front tibia with 4 spaced movable spines along ventro-anterior margin, a flattened oval tympanal area on each side near base, that of anterior surface well developed and apparently functional, posterior 1 narrow and rudimentary in appearance. Mid- and hind femora unarmed ventrally, latter swollen in basal half, uniformly slender in apical half; hind tibia with about 25 short serrationlike spines on each dorsal margin, 2 pairs of short, sturdy apical spurs; all tarsi with regularly spaced fine setae of moderate length, especially ventrally.

Male abdomen with posterior margin of last tergum (10) deeply divided; subgenital plate bearing distinct styli; cerci elongate.

Female unknown.

Type of genus: *Phlugiola gressitti* Chopard, 1969.

A SPECIMEN OF UNCERTAIN GENERIC PLACEMENT FROM THE
PHILIPPINE ISLANDS

A single Philippine female specimen resembling but apparently distinct generically from *Phlugiola* is of considerable interest, and its characters are noted here as a possible aid to the eventual recognition of

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Fig. 4. *Lucienola gressitti* (Chopard), male. Lateral view of head and thorax. *te*—tegmen (front wing).

an associated male: Mt. Lobi, Dagami, Leyte, P. I. VIII-4-1945, E. R. Helwig (A. N. S. P.).

Head as in *Phlugiola*; front tibia with 1 pair tiny apical spurs, a large open tympanum on each side near base; front femur with 4 ventro-anterior spines, 1 ventro-posterior spine; middle tibia with 1 pair short ventral spines a little distad of middle, 1 pair tiny apical spurs; hind tibia with 2 pairs apical spurs. Prosternum unarmed; pronotum more elongate, less oval when seen from above than in female of *Phlugiola*; tegmina simple, unveined, fully visible, reaching onto tergum 2; acoustic spiracle on epimeron, but very small and more ventral than in *Phlugiola*. Cerci very long and slender, about half length of ovipositor; latter much swollen in basal third and similar to *Phlugiola*.

Measurements: Listed following description of *Phlugiola redtenbacheri* male.

The eventual discovery of an associated male will doubtless supply characters helpful to the generic placement of the foregoing female.

NOTES ON SUBFAMILY PLACEMENT OF PHLUGIOLA

Prior to Karny (1924), *Phlugiola* was placed in the Listroscelinae, but the latter author broadened the Meconeminae (correctly Meconematinae, following Ragge, 1965:284) and included *Phlugiola* and various other genera formerly in the Listroscelinae. I have nothing to add to Karny's remarks on relationship or to those of Cohn (1957: 2-3). It may be noted, however, that the Japanese genus *Cecidophaga* Karny, 1921 is preoccupied in Lepidoptera (Gelechiidae) by *Cecidophaga* Walsingham, 1911, and Uvarov (1939) proposed the replacement name *Cecidophagula*.

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